ENSO: Recent Evolution, Current Status and Predictions

Update prepared by:
Climate Prediction Center / NCEP
10 April 2017

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Recent Evolution and Current Conditions

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Summary

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ENSO Alert System Status: Not Active

ENSO-neutral conditions are present.*

Equatorial sea surface temperatures (SSTs) are near-average across the central and east-central Pacific. They are above-average in the eastern Pacific Ocean.

ENSO-neutral conditions are favored to continue through at least the Northern Hemisphere spring 2017, with increasing chances for El Niño development into the fall.*

* Note: These statements are updated once a month (2nd Thursday of each month) in association with the ENSO Diagnostics Discussion, which can be found by clicking here.

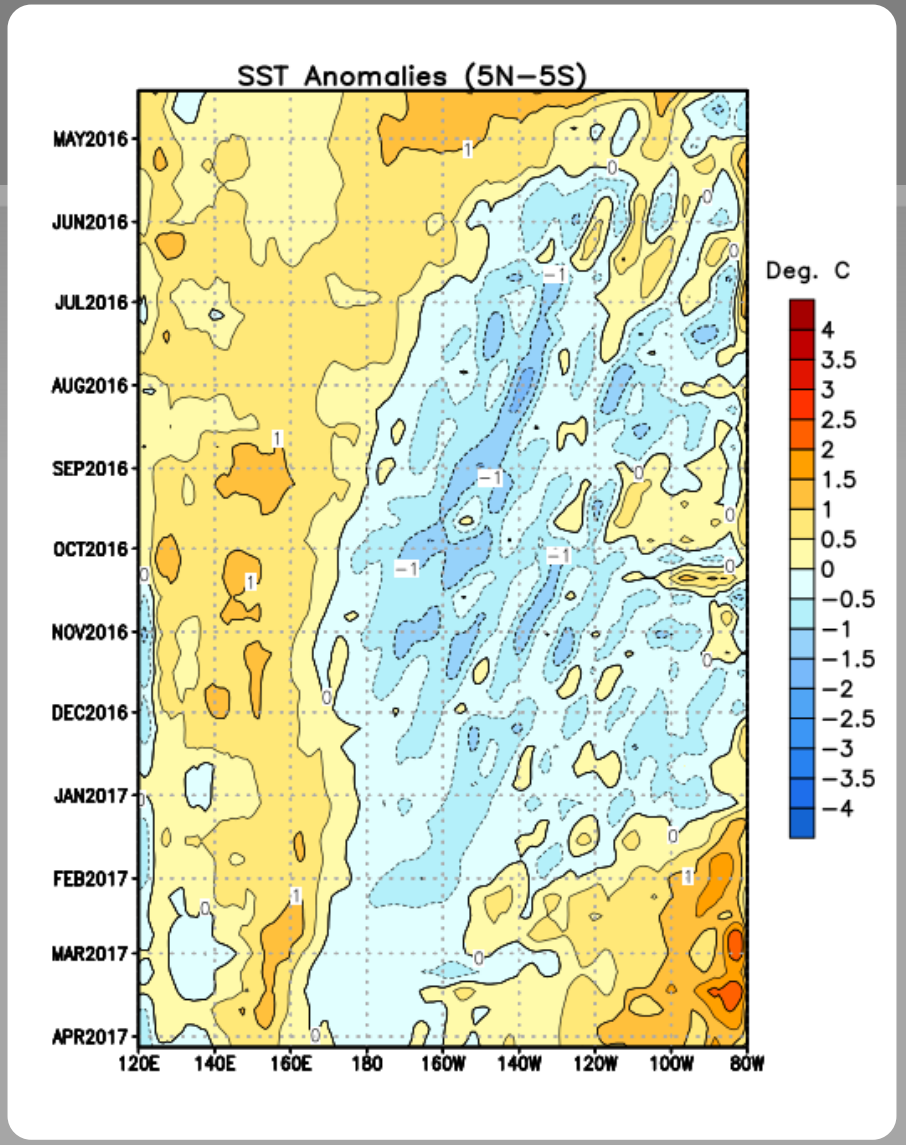
Recent Evolution of Equatorial Pacific SST Departures (°C)

From July through December 2016, below average SSTs were observed over most of the central and eastern Pacific Ocean.

During January and February 2017, above-average SSTs expanded within the eastern Pacific Ocean.

Recently, near-average SSTs remain in the central and east-central Pacific Ocean.

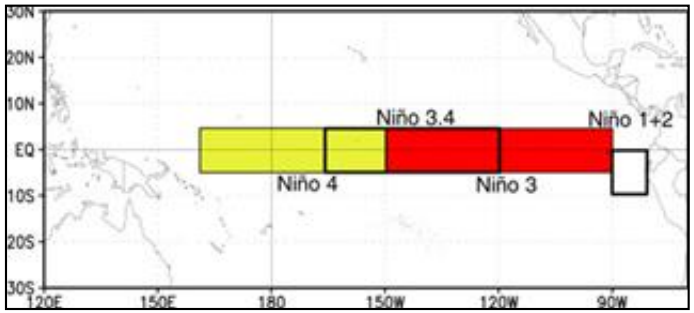
Above-average SSTs persist in the eastern Pacific, with SST anomalies decreasing over the past couple of weeks.

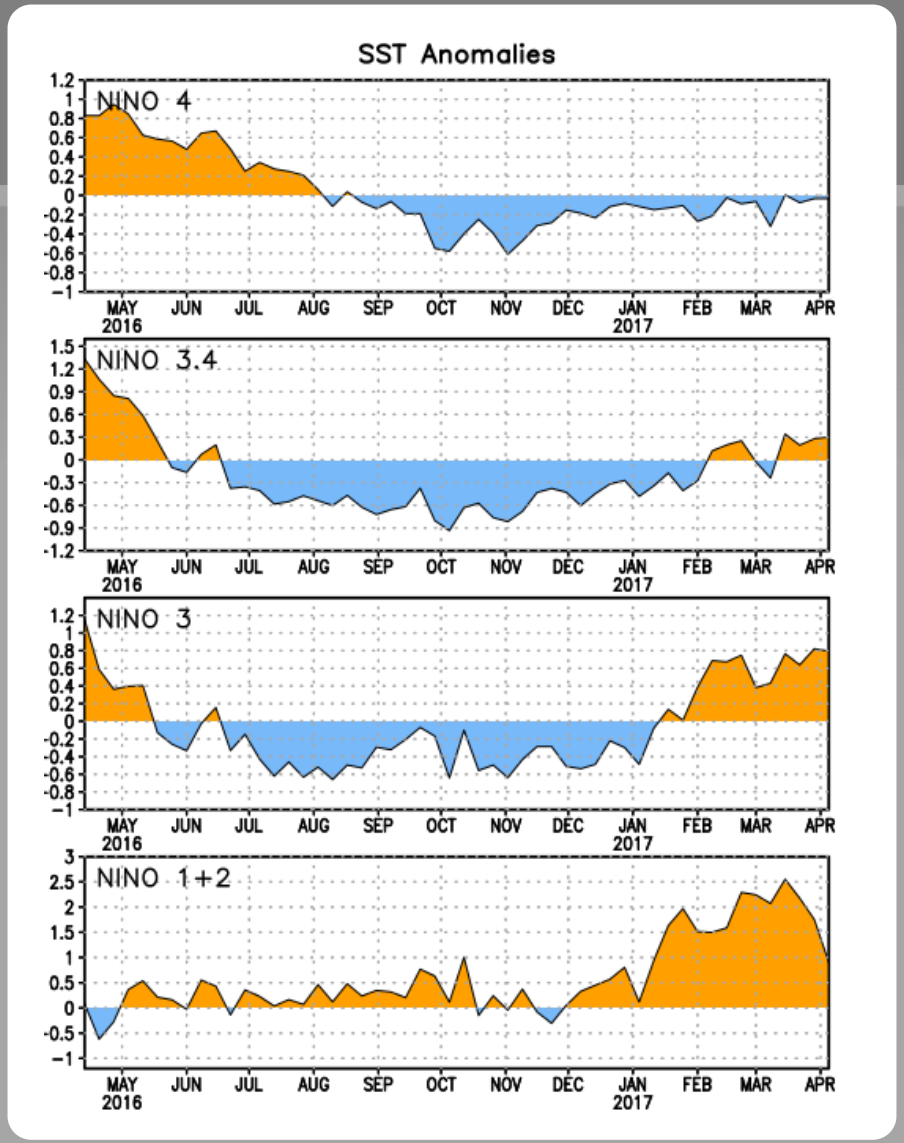


Niño Region SST Departures (ºC) Recent Evolution

The latest weekly SST departures are:

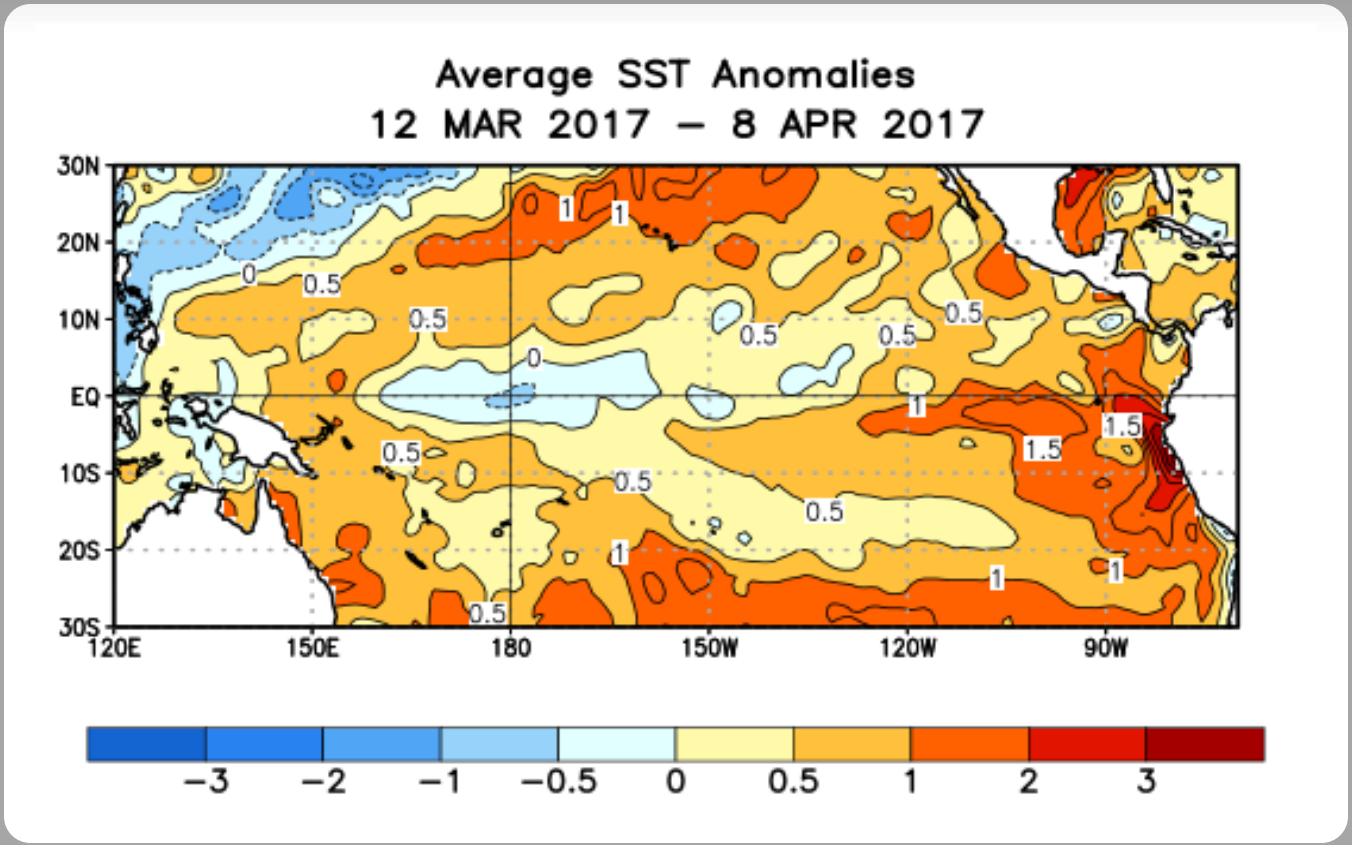
Niño 4	0.0ºC
Niño 3.4	0.3ºC
Niño 3	0.8ºC
Niño 1+2	0.9ºC





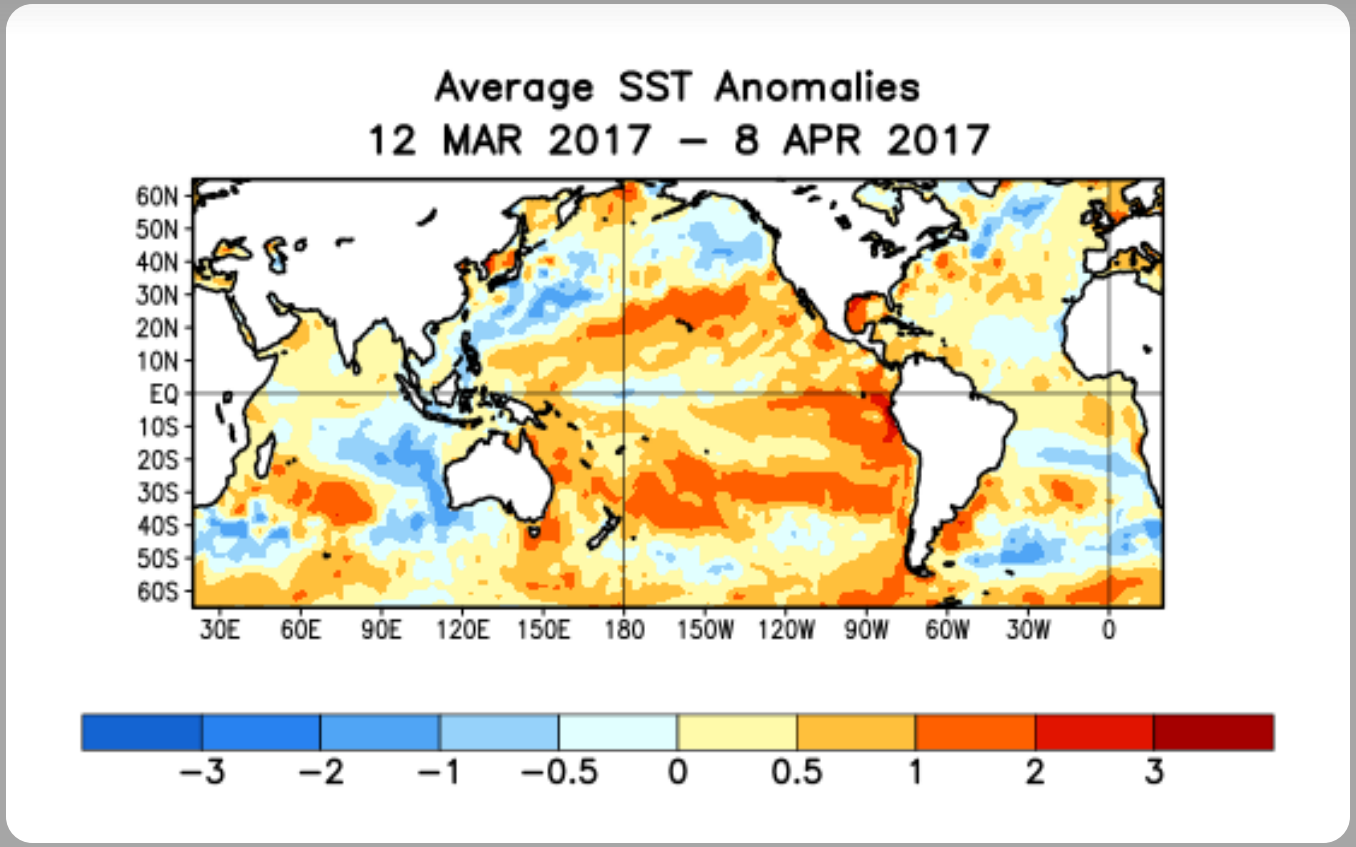
SST Departures (ºC) in the Tropical Pacific During the Last Four Weeks

During the last four weeks, equatorial SSTs were near-average across the central Pacific Ocean, and above-average across the eastern Pacific.



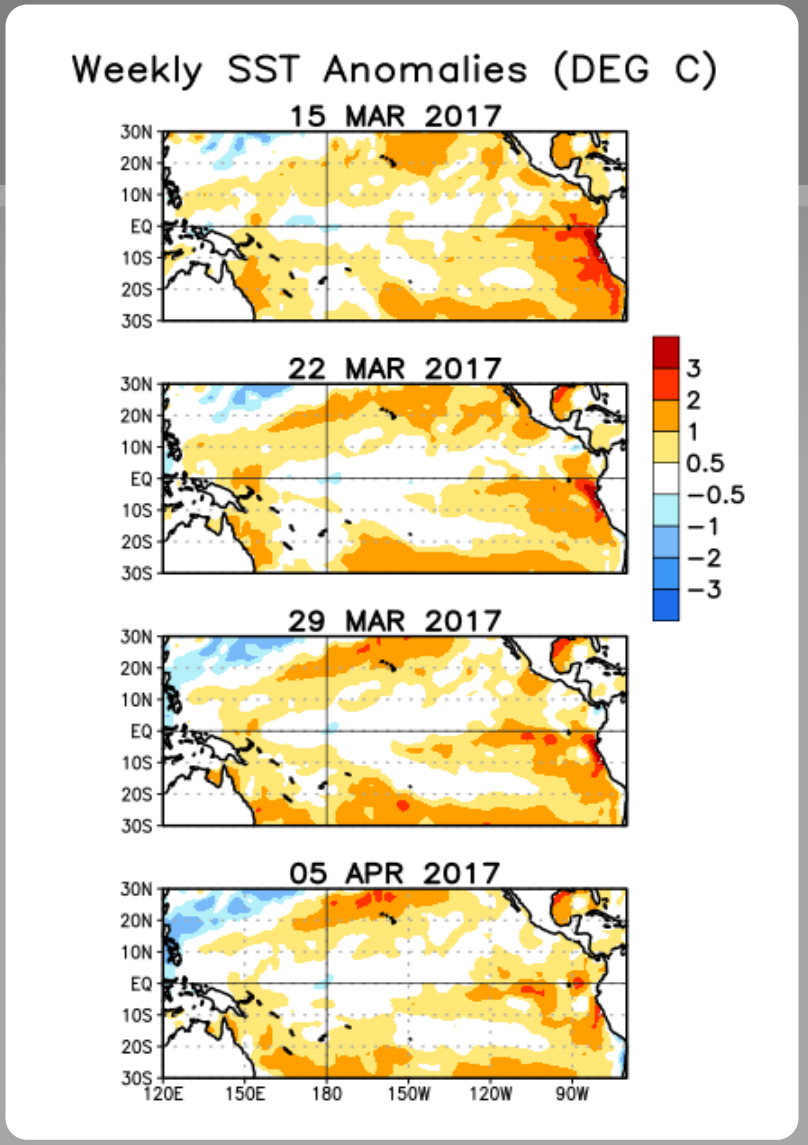
Global SST Departures (°C) During the Last Four Weeks

During the last four weeks, equatorial SSTs were above average in the eastern Pacific and near-average across the central Pacific Ocean.



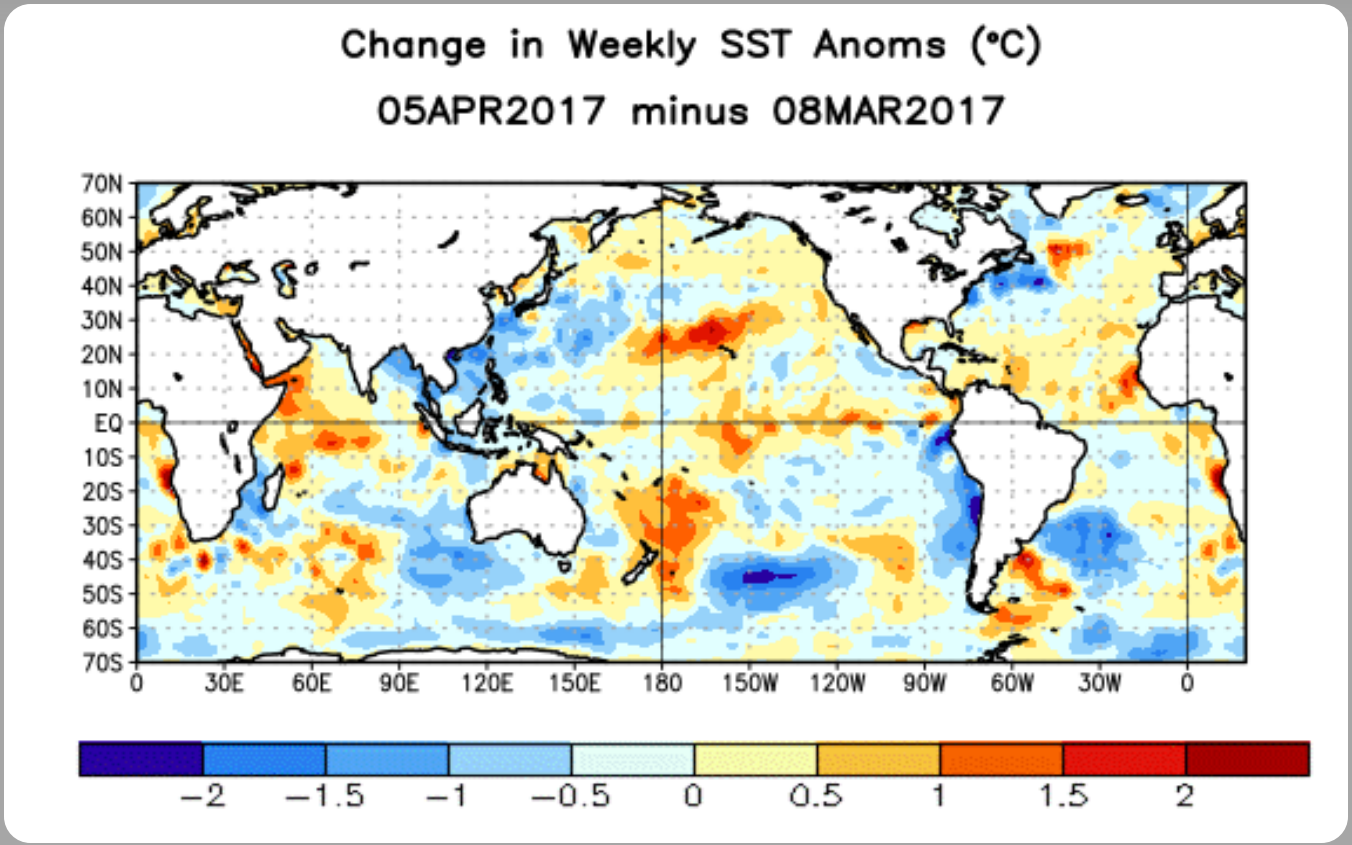
Weekly SST Departures during the Last Four Weeks

During the last four weeks, near-average SSTs continued in the central Pacific and above-average SSTs have weakened in the eastern Pacific.



Change in Weekly SST Departures over the Last Four Weeks

During the last four weeks, negative changes in equatorial SST anomalies were evident near the S. American coast and positive changes were evident across the rest of the central and eastern Pacific Ocean.



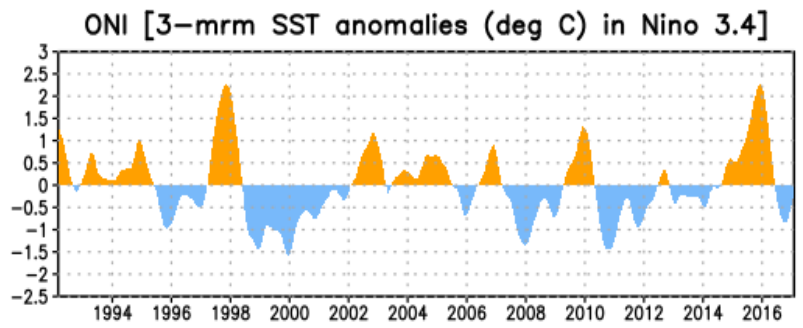
Upper-Ocean Conditions in the Equatorial Pacific

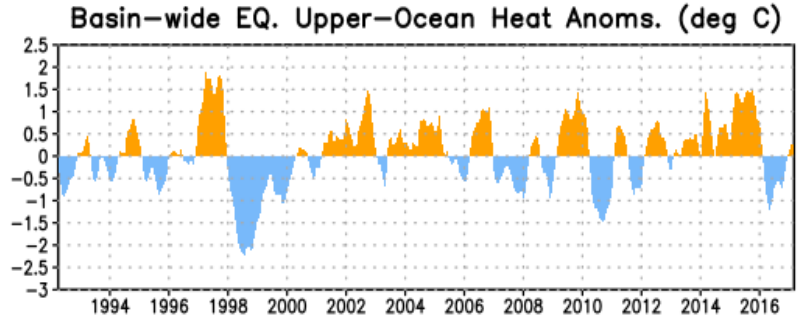
The basin-wide equatorial upper ocean (0-300 m) heat content is greatest prior to and during the early stages of a Pacific warm (El Niño) episode (compare top 2 panels), and least prior to and during the early stages of a cold (La Niña) episode.

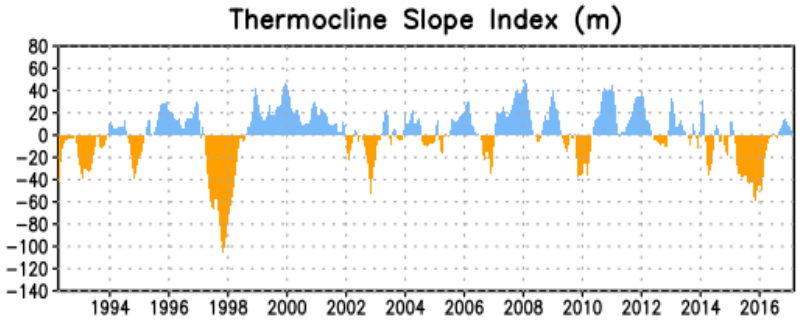
The slope of the oceanic thermocline is least (greatest) during warm (cold) episodes.

Recent values of the upper-ocean heat anomalies (near average) and thermocline slope index (near average) reflect ENSO-neutral conditions.

The monthly thermocline slope index represents the difference in anomalous depth of the 20°C isotherm between the western Pacific (160°E-150°W) and the eastern Pacific (90°-140°W).

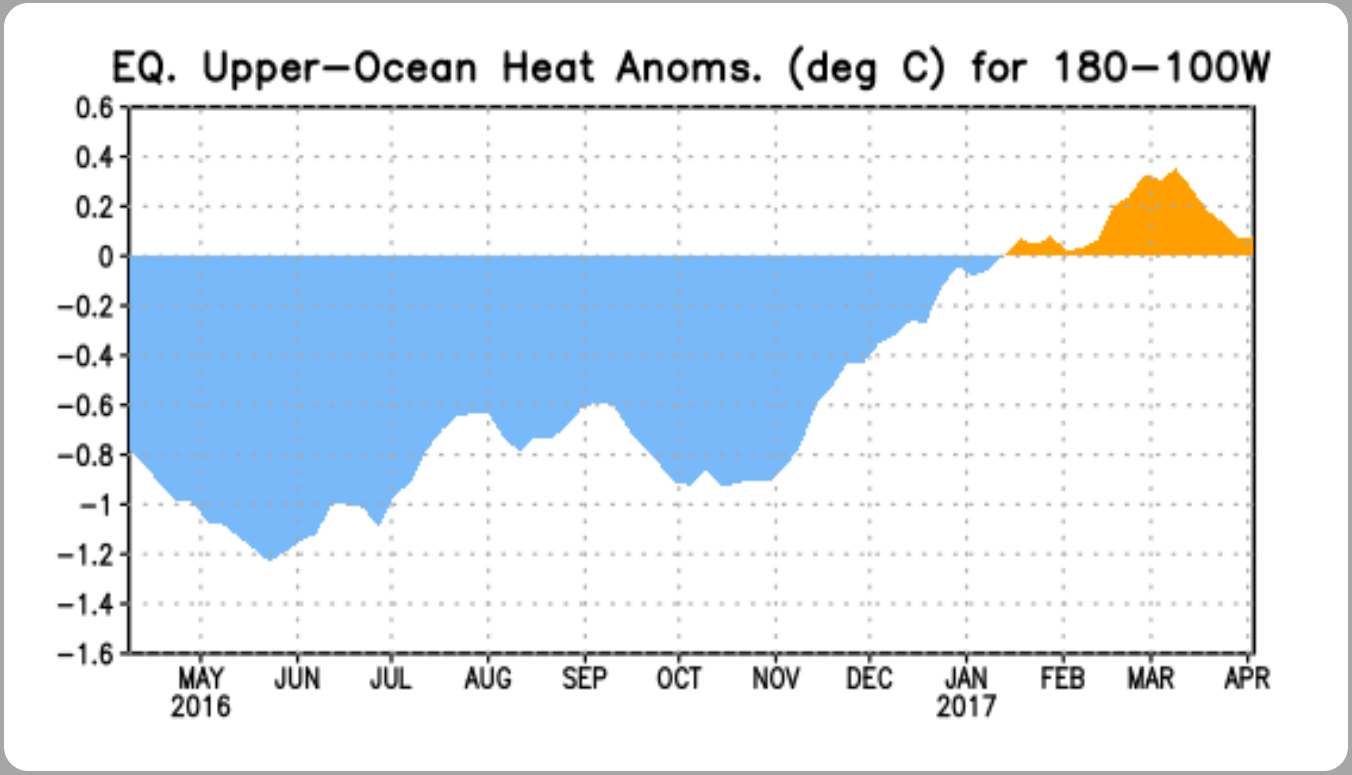






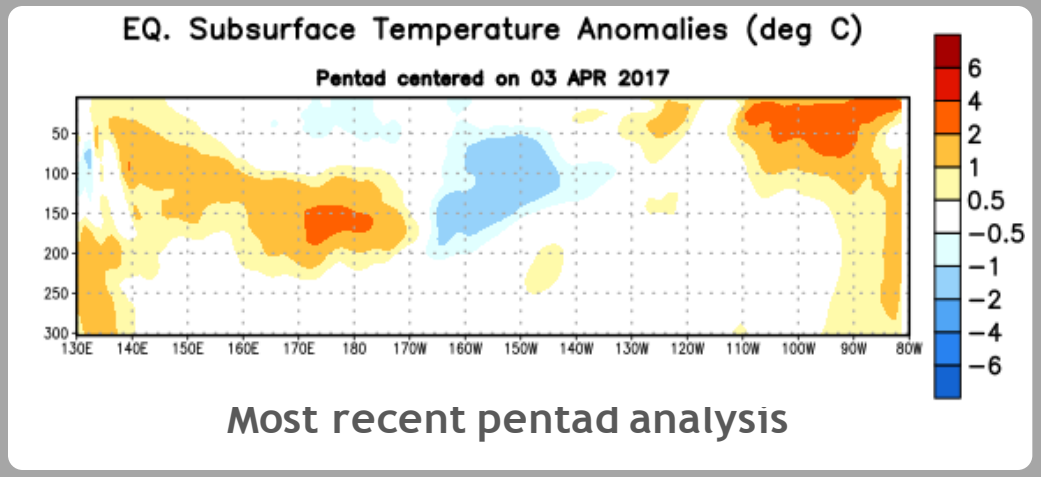
Central and Eastern Pacific Upper-Ocean (0-300 m) Weekly Average Temperature Anomalies

Negative subsurface temperature anomalies were present from March 2016 through December 2016. Positive anomalies have been present since mid-January 2017, though recently returning to near zero values.



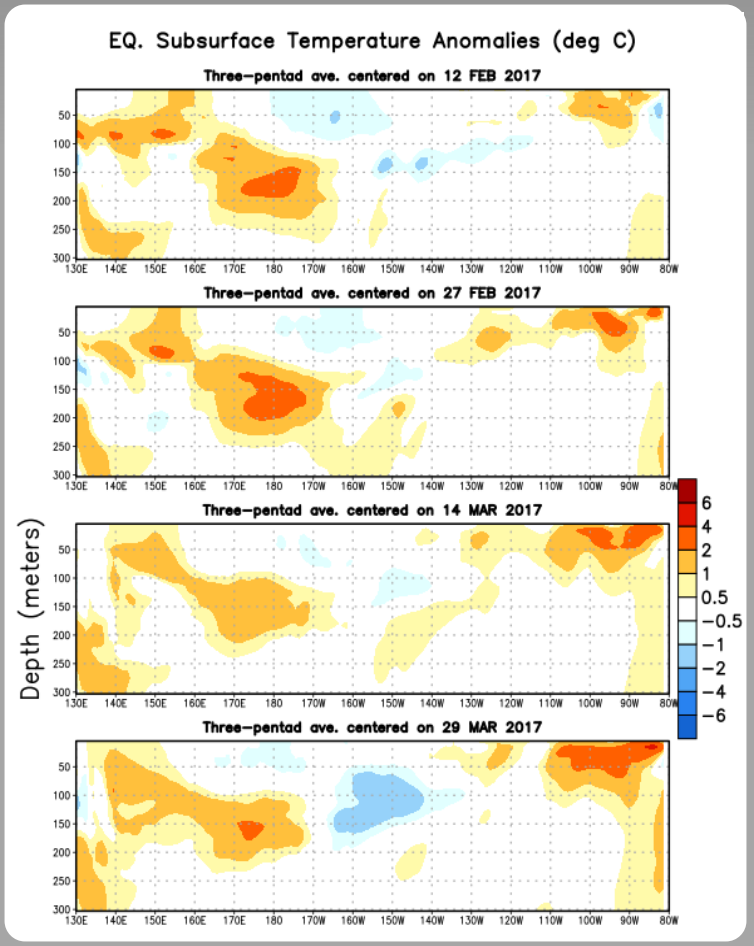
Sub-Surface Temperature Departures in the Equatorial Pacific

During the last two months, positive subsurface temperature anomalies have persisted in the western and eastern Pacific Ocean.



Most recent pentad analysis

Recently, negative subsurface temperature anomalies increased in the central equatorial Pacific Ocean.

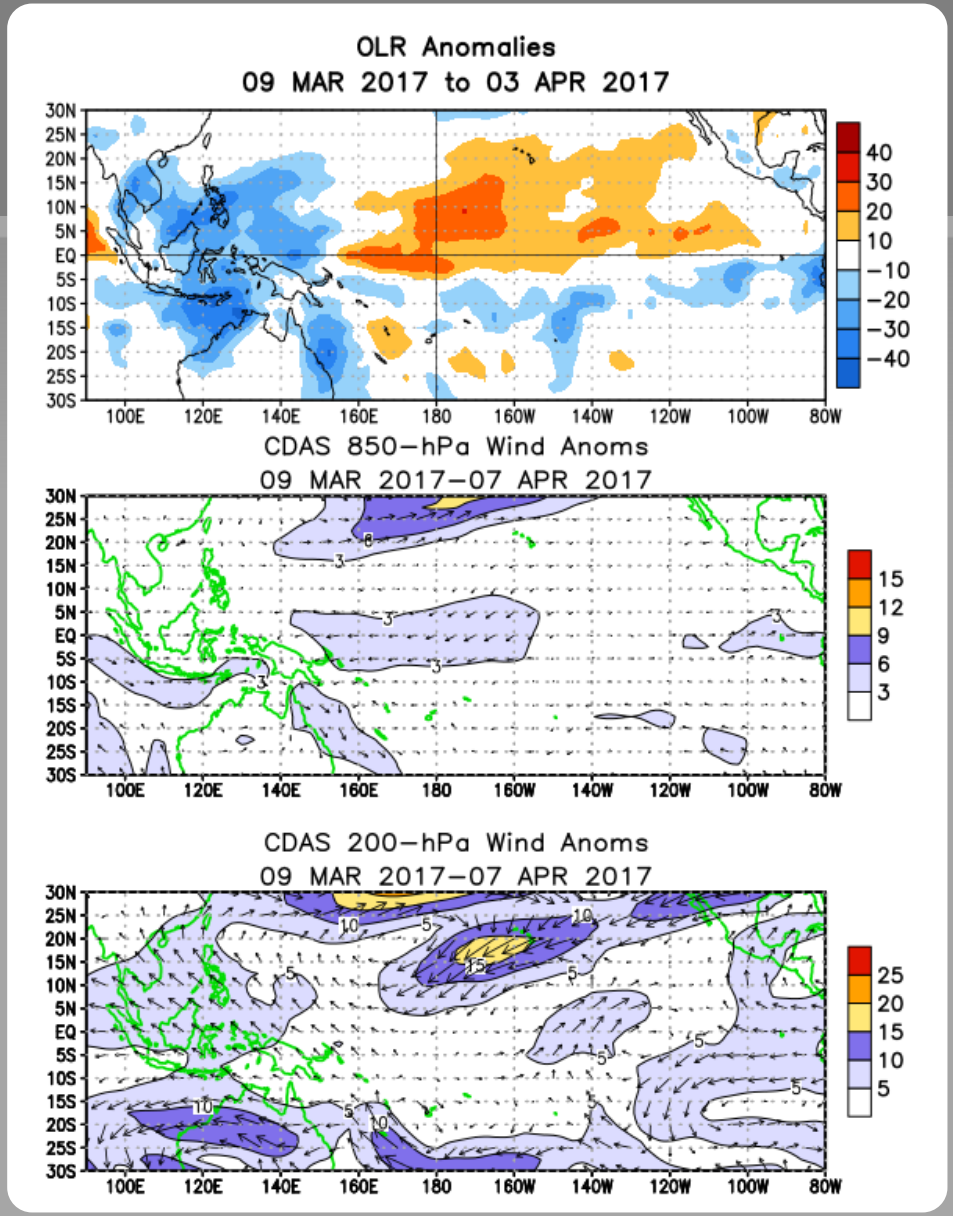


Tropical OLR and Wind Anomalies During the Last 30 Days

Negative OLR anomalies (enhanced convection and precipitation) were evident over the Philippines, Southeast Asia, Indonesia, and south of the equator across the Pacific Ocean. Positive OLR anomalies (suppressed convection and precipitation) were observed around the International Date Line and north of the equator in the central to eastern Pacific.

Low-level (850-hPa) anomalous westerlies were evident over the eastern tropical Pacific Ocean, while anomalous easterlies were observed in the central and western Pacific.

Upper-level (200-hPa) anomalous easterlies were evident over the eastern Pacific Ocean, while anomalous westerlies were evident over the east-central Pacific.



Intraseasonal Variability

Intraseasonal variability in the atmosphere (wind and pressure), which is often related to the Madden-Julian Oscillation (MJO), can significantly impact surface and subsurface conditions across the Pacific Ocean.

Related to this activity:

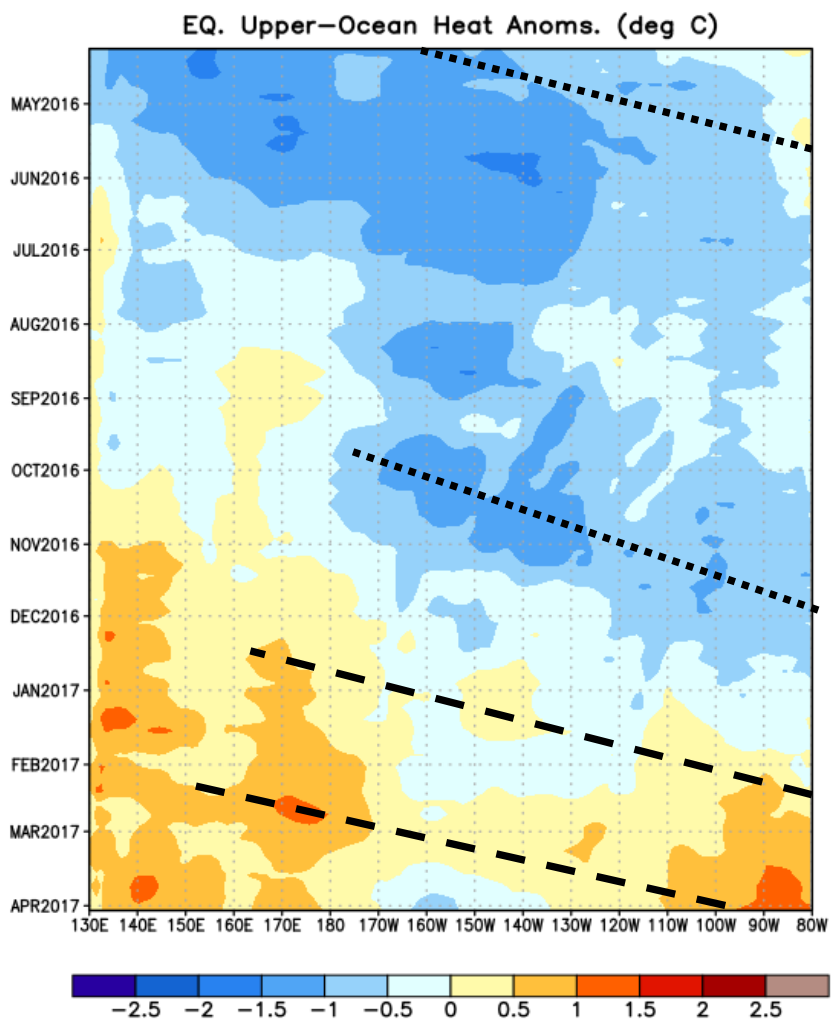
Significant weakening of the low-level easterly winds usually initiates an eastward-propagating oceanic Kelvin wave.

Weekly Heat Content Evolution in the Equatorial Pacific

With the passage of an upwelling equatorial oceanic Kelvin wave in March 2016, below-average subsurface temperatures extended across much of the equatorial Pacific.

Since December 2016- January 2017, positive subsurface temperature anomalies have persisted in the western and eastern Pacific Ocean.

Since mid March 2017, negative subsurface temperature anomalies have emerged east of the Date Line.



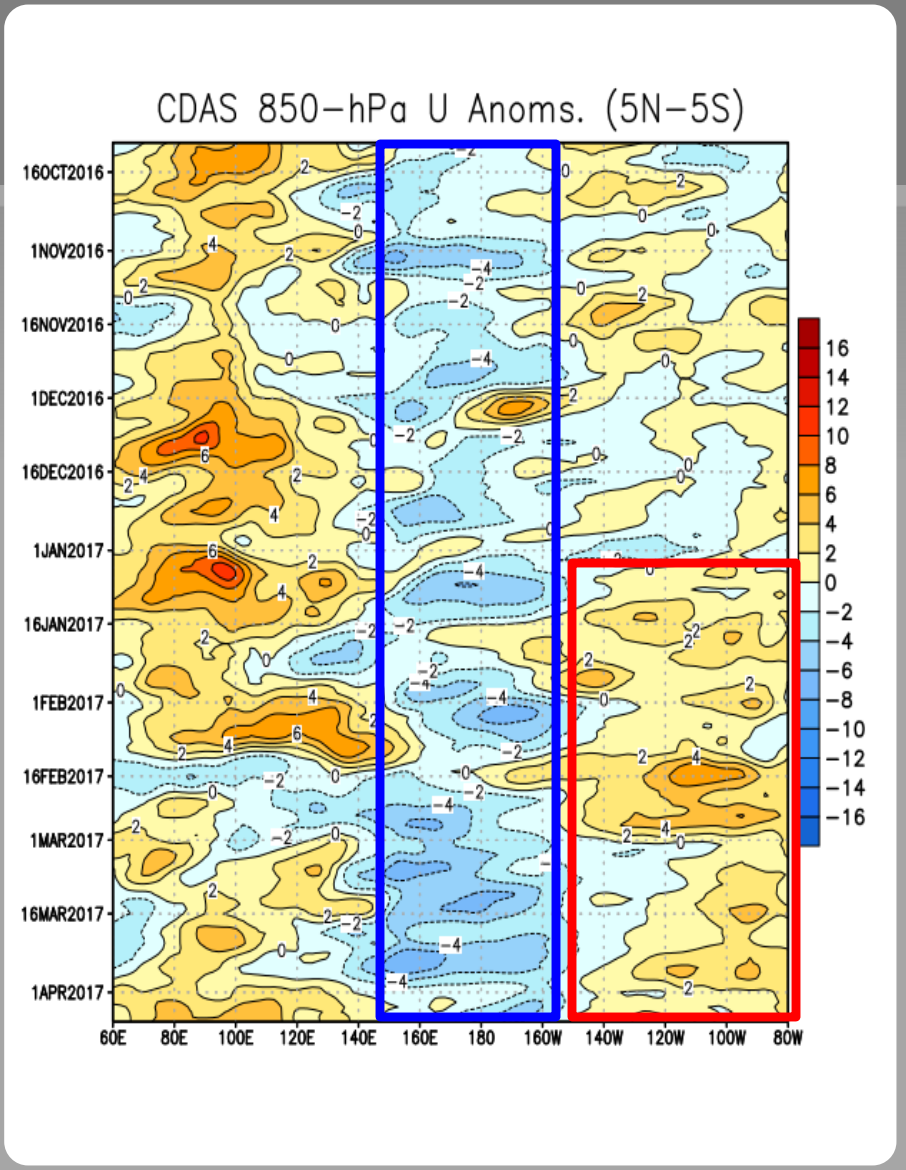
Equatorial oceanic Kelvin waves have alternating warm and cold phases. The warm phase is indicated by dashed lines. Down-welling and warming occur in the leading portion of a Kelvin wave, and up-welling and cooling occur in the trailing portion.

Low-level (850-hPa) Zonal (east-west) Wind Anomalies (m s^{-1})

Since mid September 2016, low-level easterly wind anomalies generally persisted over the central and western equatorial Pacific.

Since January 2017, westerly wind anomalies were observed over the eastern Pacific Ocean.

Over the last week, the low-level easterly wind anomalies continued over the central equatorial Pacific, while westerly anomalies persisted over the far eastern Pacific.



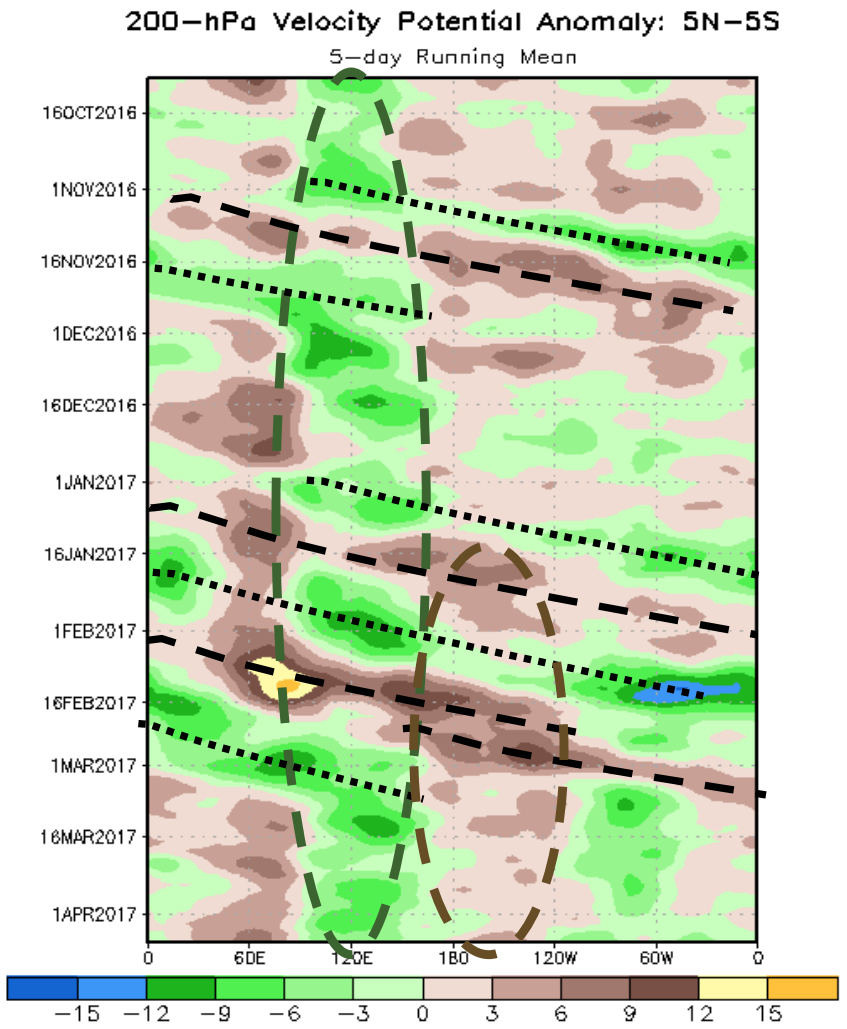
Westerly Wind Anomalies (orange/red shading)
Easterly Wind Anomalies (blue shading)

Upper-level (200-hPa) Velocity Potential Anomalies

Eastward propagation of regions of upper-level divergence (green shading) and convergence (brown shading) are particularly evident during November 2016, and January-February 2017.

Since September 2016, anomalous upper-level divergence has generally persisted near Indonesia.

Since January 2017, anomalous upper-level convergence has mostly continued across the central and east-central equatorial Pacific.



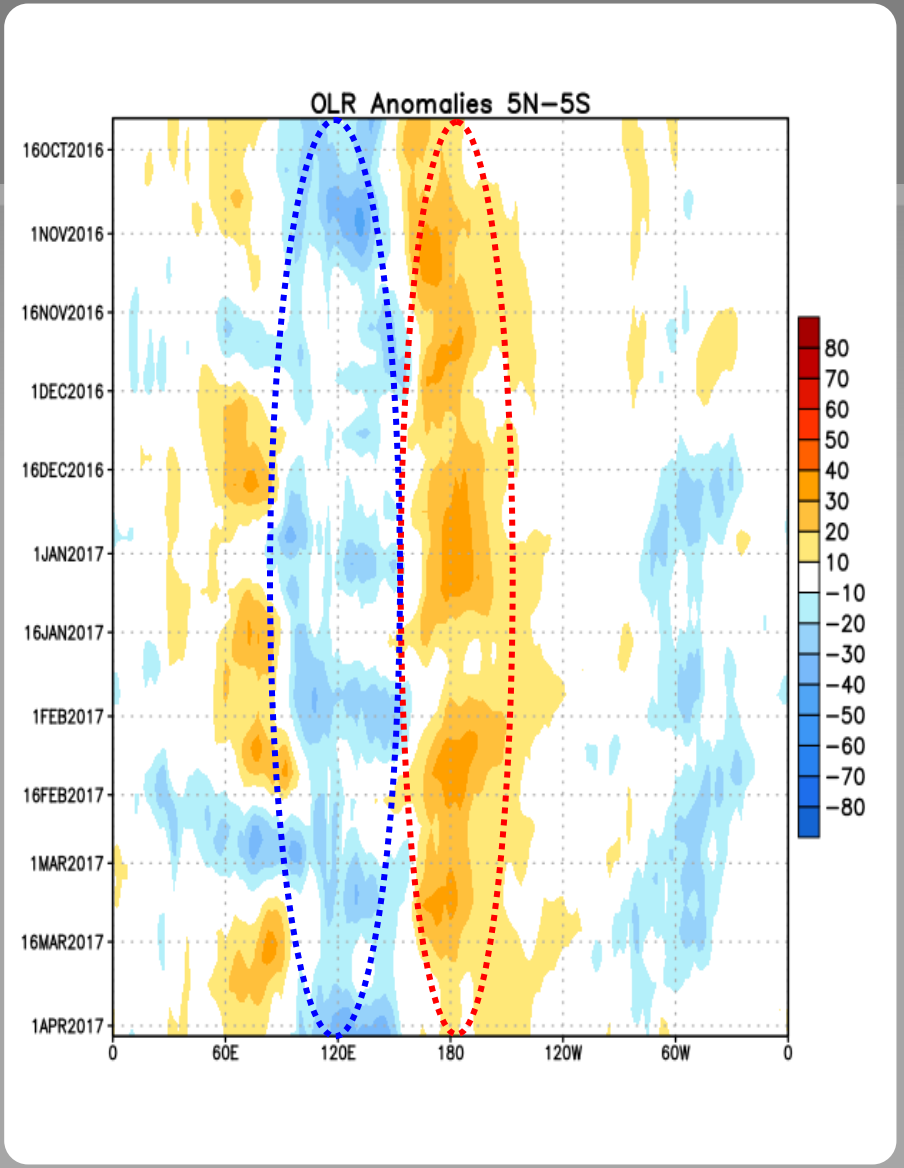
Unfavorable for precipitation (brown shading)
Favorable for precipitation (green shading)

Note: Eastward propagation is not necessarily indicative of the Madden-Julian Oscillation (MJO).

Outgoing Longwave Radiation (OLR) Anomalies

Since early August 2016, positive OLR anomalies have persisted near the International Date Line.

Since early September 2016, negative OLR anomalies have generally persisted near the Maritime Continent/far western Pacific Ocean.



Drier-than-average Conditions (orange/red shading)
Wetter-than-average Conditions (blue shading)

Oceanic Niño Index (ONI)

The ONI is based on SST departures from average in the Niño 3.4 region, and is a principal measure for monitoring, assessing, and predicting ENSO.

Defined as the three-month running-mean SST departures in the Niño 3.4 region. Departures are based on a set of improved homogeneous historical SST analyses (Extended Reconstructed SST – ERSST.v4). The SST reconstruction methodology is described in Huang et al., 2015, J. Climate, vol. 28, 911-930.)

It is one index that helps to place current events into a historical perspective

NOAA Operational Definitions for El Niño and La Niña

El Niño: characterized by a positive ONI greater than or equal to +0.5°C.

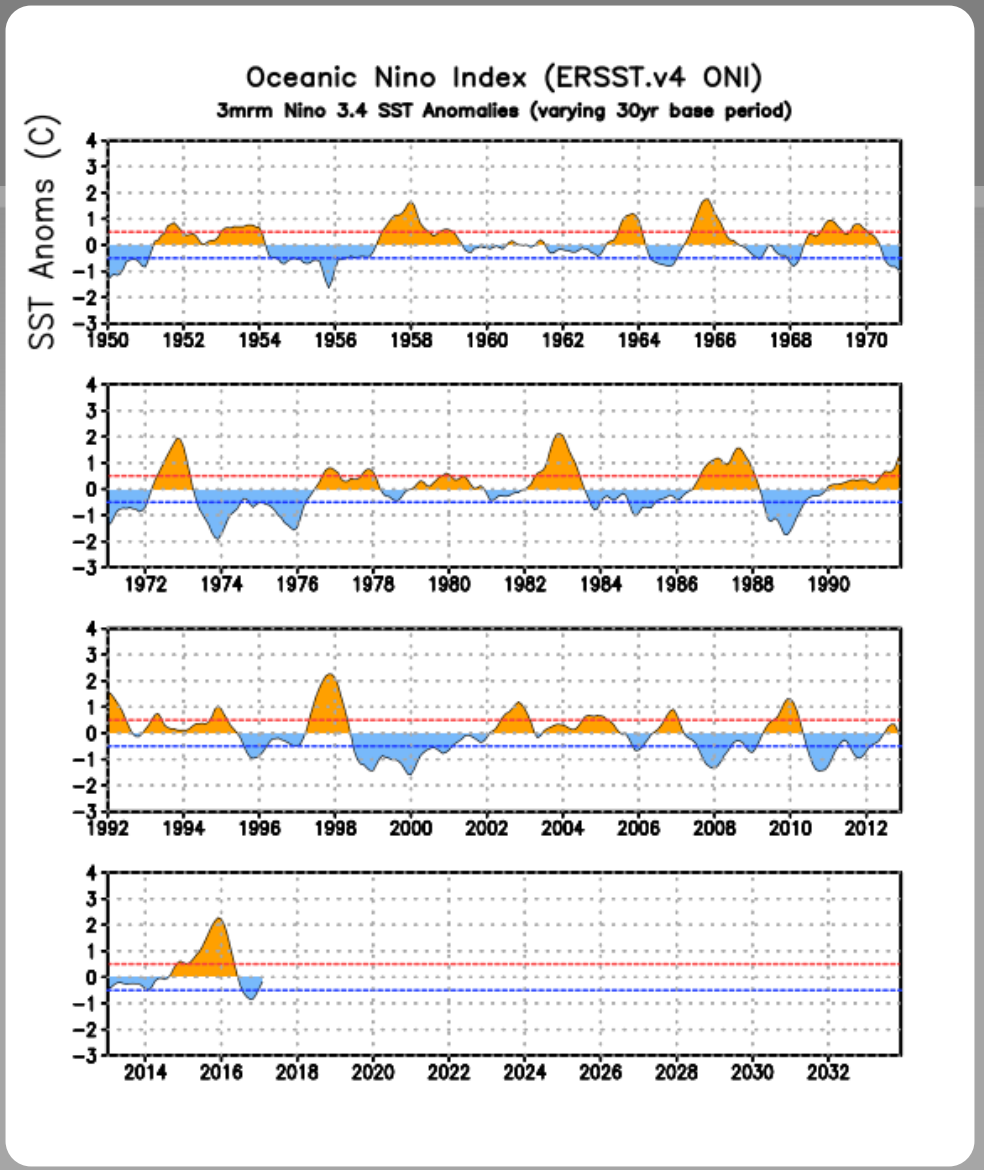
La Niña: characterized by a negative ONI less than or equal to -0.5°C.

By historical standards, to be classified as a full-fledged El Niño or La Niña episode, these thresholds must be exceeded for a period of at least 5 consecutive overlapping 3-month seasons.

CPC considers El Niño or La Niña conditions to occur when the monthly Niño3.4 OISST departures meet or exceed +/- 0.5°C along with consistent atmospheric features. These anomalies must also be forecasted to persist for 3 consecutive months.

ONI (°C): Evolution since 1950

The most recent ONI value (January - March 2017) is -0.2°C.



Historical El Niño and La Niña Episodes Based on the ONI computed using ERSST.v4

Recent Pacific warm (red) and cold (blue) periods based on a threshold of +/- 0.5 °C for the Oceanic Nino Index (ONI) [3 month running mean of ERSST.v4 SST anomalies in the Nino 3.4 region (5N-5S, 120-170W)]. For historical purposes, periods of below and above normal SSTs are colored in blue and red when the threshold is met for a minimum of 5 consecutive over-lapping seasons.

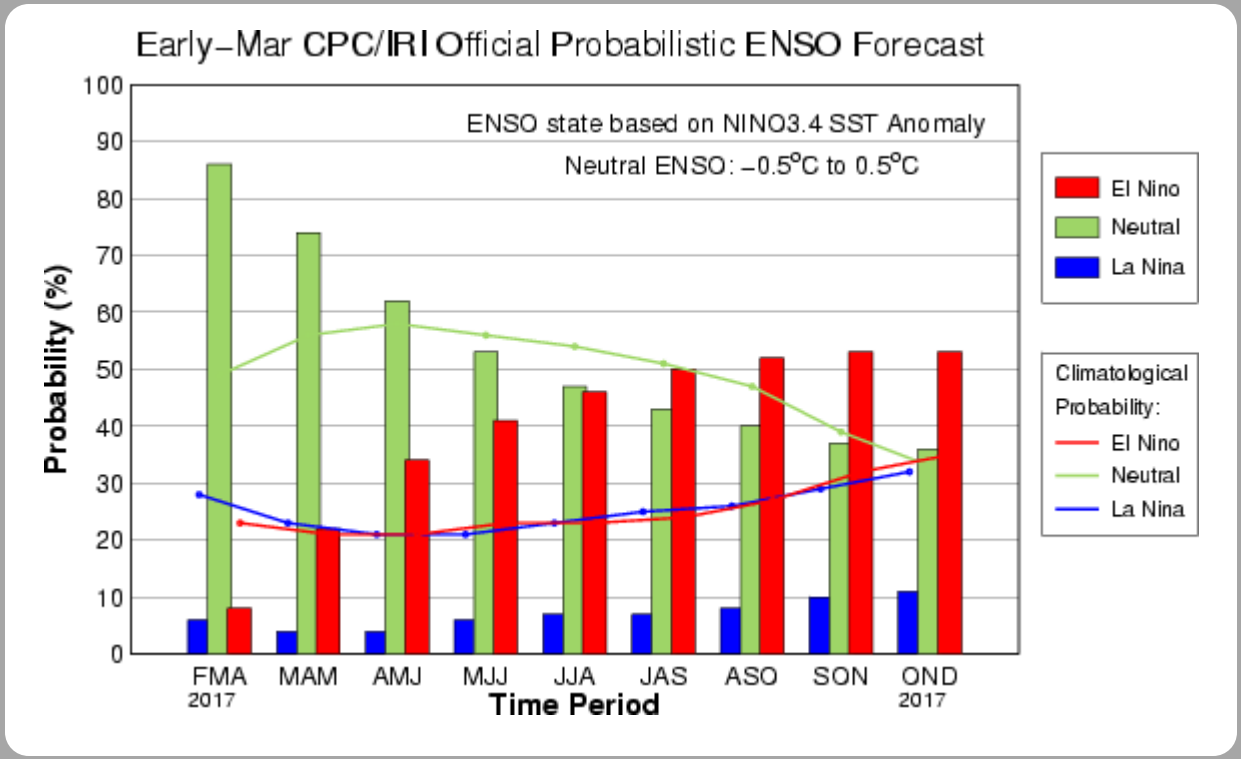
The ONI is one measure of the El Niño-Southern Oscillation, and other indices can confirm whether features consistent with a coupled ocean-atmosphere phenomenon accompanied these periods. The complete table going back to DJF 1950 can be found here.

Year	DJF	JFM	FMA	MAM	AMJ	MJJ	JJA	JAS	ASO	SON	OND	NDJ
2005	0.7	0.6	0.5	0.5	0.3	0.2	0.0	-0.1	0.0	-0.2	-0.5	-0.7
2006	-0.7	-0.6	-0.4	-0.2	0.0	0.0	0.1	0.3	0.5	0.7	0.9	0.9
2007	0.7	0.4	0.1	-0.1	-0.2	-0.3	-0.4	-0.6	-0.9	-1.1	-1.3	-1.3
2008	-1.4	-1.3	-1.1	-0.9	-0.7	-0.5	-0.4	-0.3	-0.3	-0.4	-0.6	-0.7
2009	-0.7	-0.6	-0.4	-0.1	0.2	0.4	0.5	0.5	0.6	0.9	1.1	1.3
2010	1.3	1.2	0.9	0.5	0.0	-0.4	-0.9	-1.2	-1.4	-1.5	-1.4	-1.4
2011	-1.3	-1.0	-0.7	-0.5	-0.4	-0.3	-0.3	-0.6	-0.8	-0.9	-1.0	-0.9
2012	-0.7	-0.5	-0.4	-0.4	-0.3	-0.1	0.1	0.3	0.3	0.3	0.1	-0.2
2013	-0.4	-0.4	-0.3	-0.2	-0.2	-0.2	-0.3	-0.3	-0.2	-0.3	-0.3	-0.3
2014	-0.5	-0.5	-0.4	-0.2	-0.1	0.0	-0.1	0.0	0.1	0.4	0.5	0.6
2015	0.6	0.5	0.6	0.7	0.8	1.0	1.2	1.4	1.7	2.0	2.2	2.3
2016	2.2	2.0	1.6	1.1	0.6	0.1	-0.3	-0.6	-0.8	-0.8	-0.8	-0.7
2017	-0.4	-0.2										

CPC/IRI Probabilistic ENSO Outlook

Updated: 9 March 2017

ENSO-neutral is favored through mid-2017, with a slight tilt toward El Niño (~50%) during the late summer through fall 2017.



IRI/CPC Pacific Niño 3.4 SST Model Outlook

Most dynamical models favor El Niño during the early Northern Hemisphere summer 2017, while statistical models favor ENSO-neutral through the Northern Hemisphere autumn 2017.

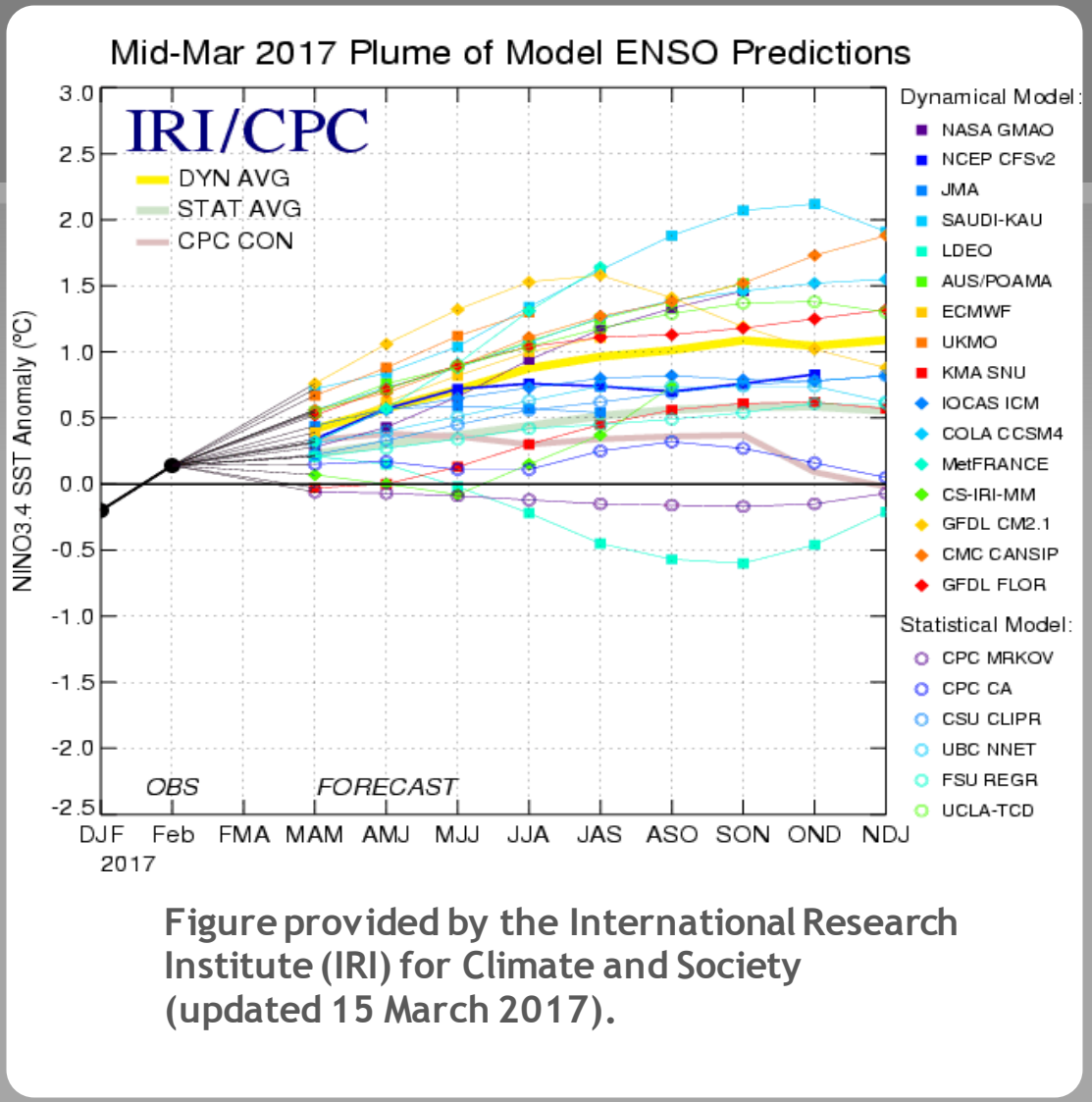
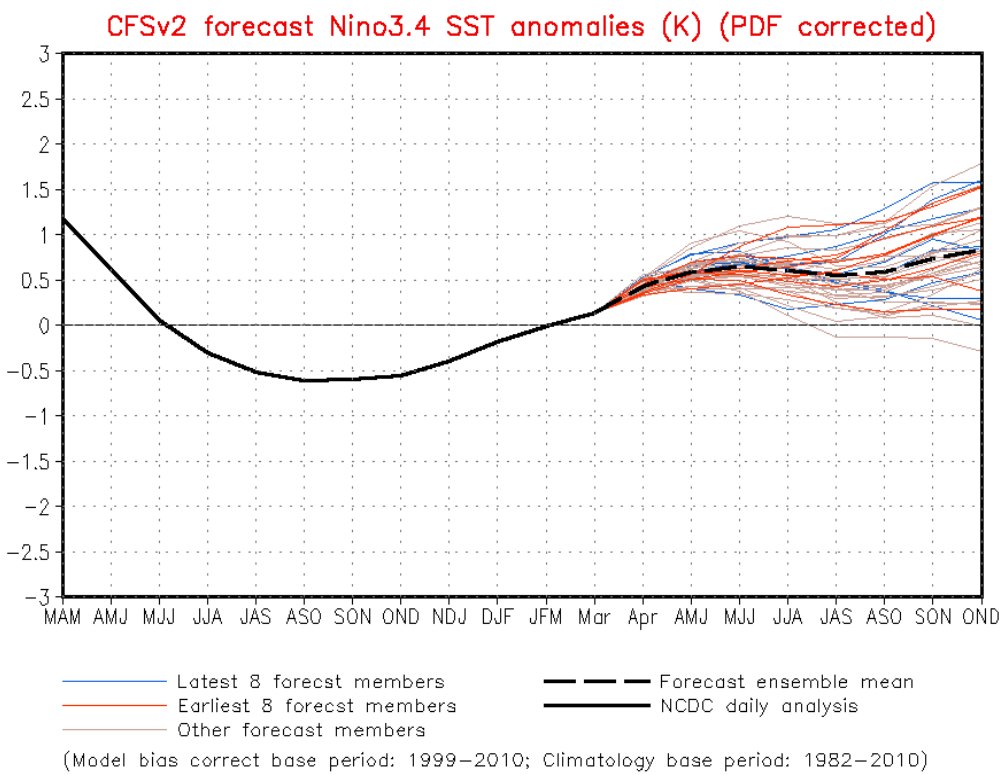


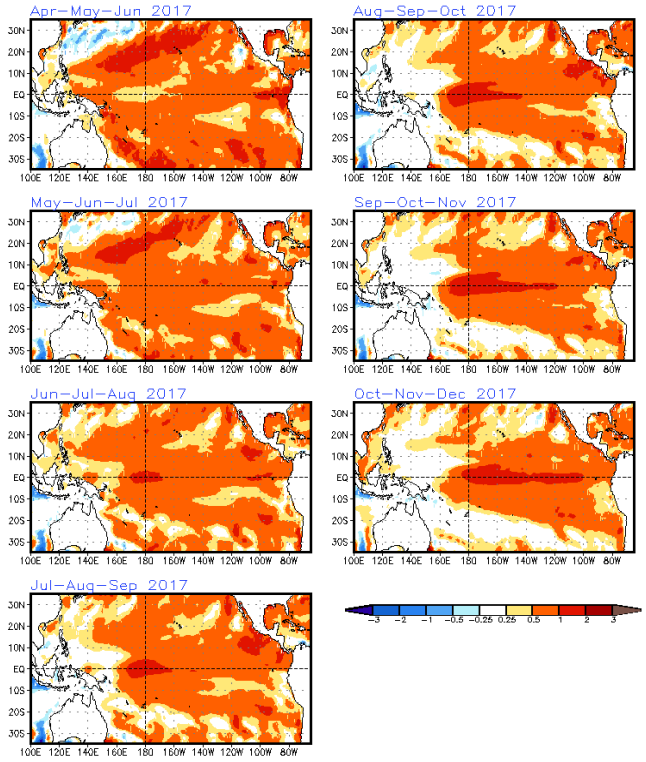
Figure provided by the International Research Institute (IRI) for Climate and Society (updated 15 March 2017).

SST Outlook: NCEP CFS.v2 Forecast (PDF corrected)

Issued: 7 April 2017

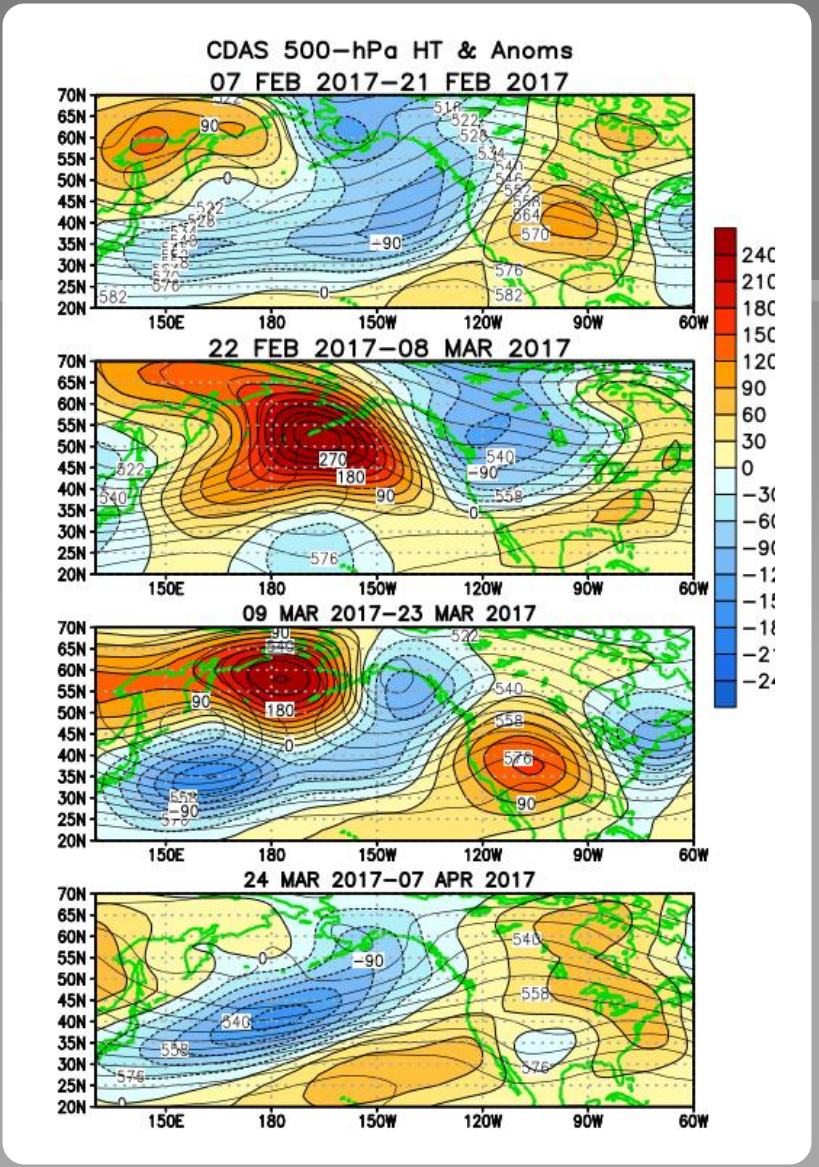
The CFS.v2 ensemble mean (black dashed line) favors borderline ENSO-neutral/weak El Niño to develop during the Northern Hemisphere spring 2017, with El Niño conditions favored during autumn of 2017.





Atmospheric anomalies over the North Pacific and North America During the Last 60 Days

Since early February 2017, above-average heights and temperatures have prevailed over the southern United States, while heights and temperatures have varied over the North Pacific Ocean and the western U.S.



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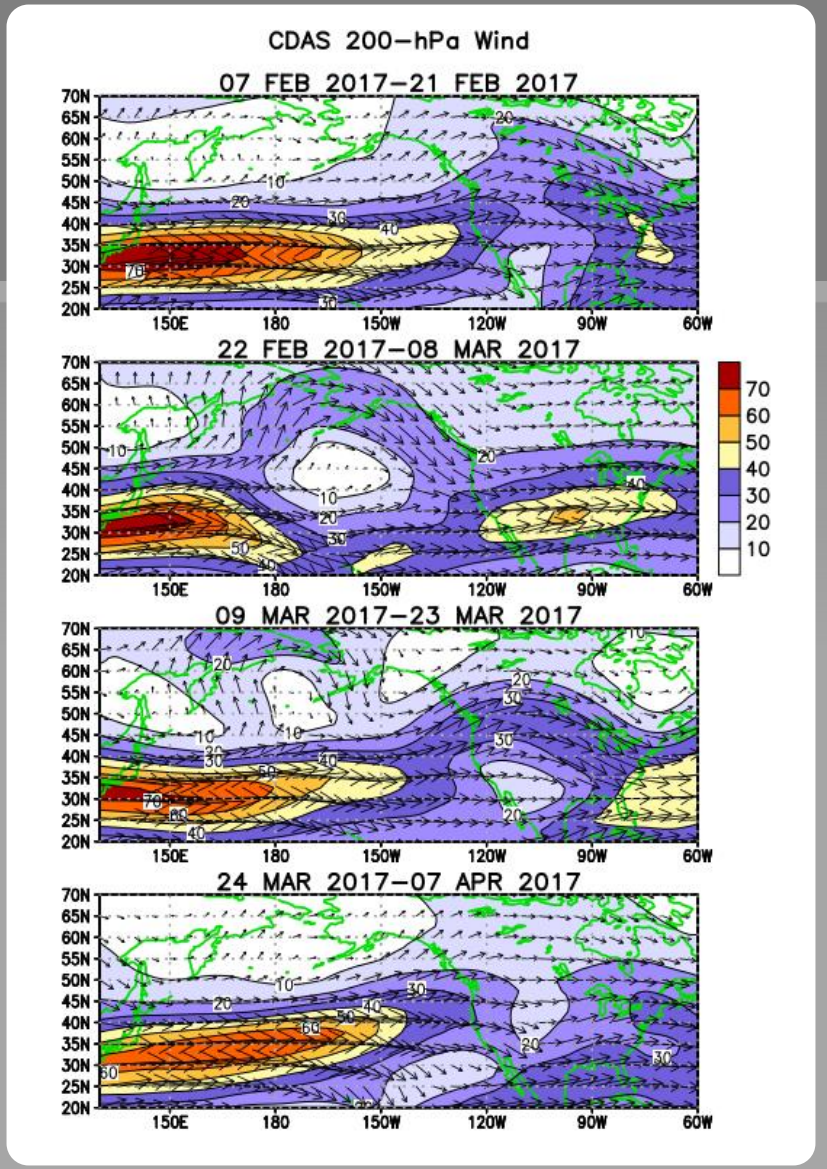

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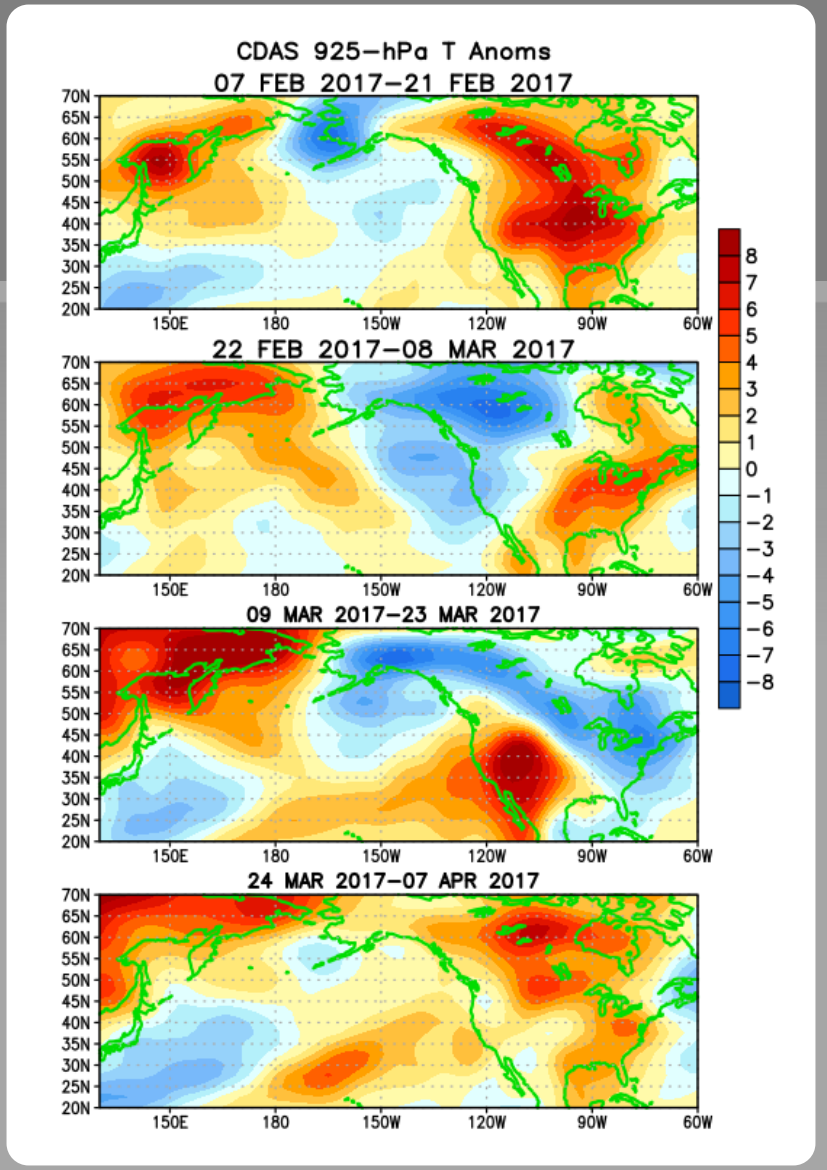
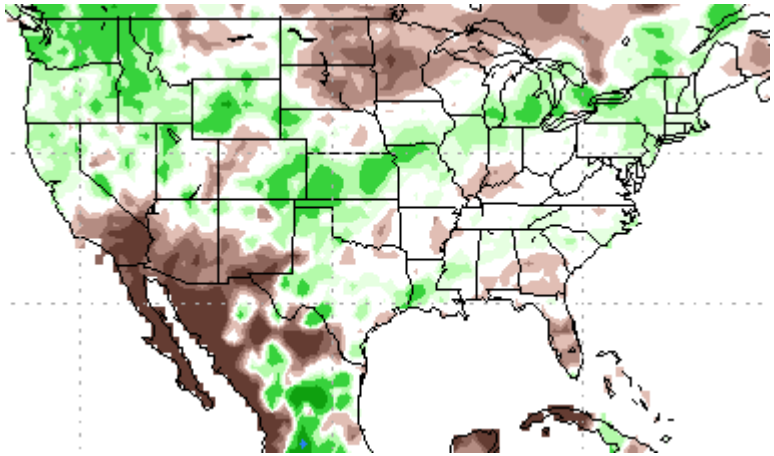


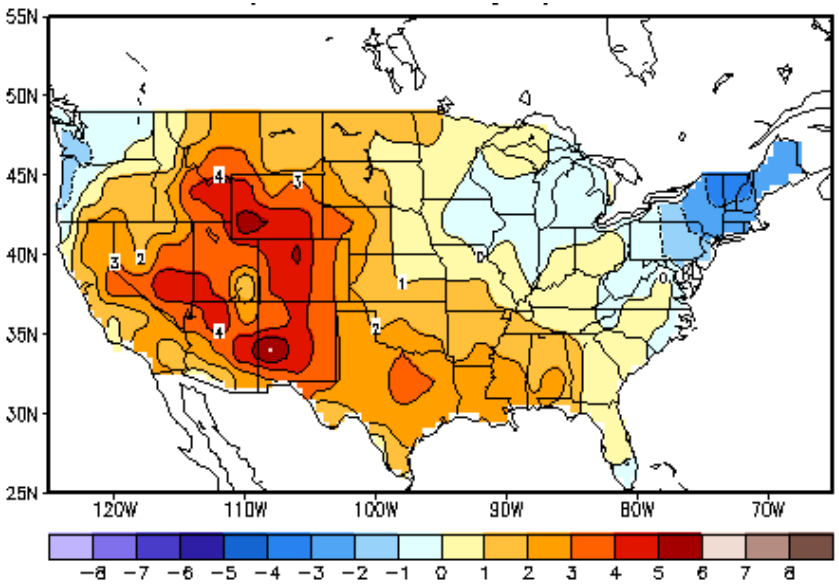
U.S. Temperature and Precipitation Departures During the Last 30 Days

End Date: 8 April 2017

Percent of Average Precipitation



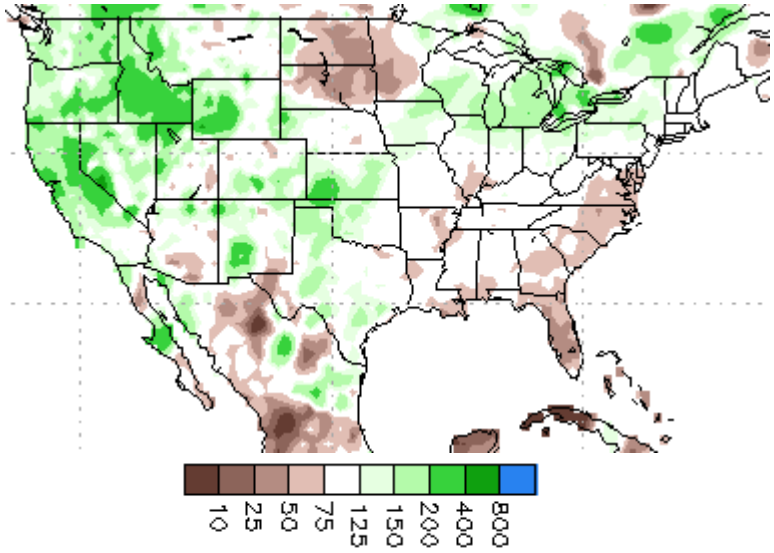
Temperature Departures (degree C)



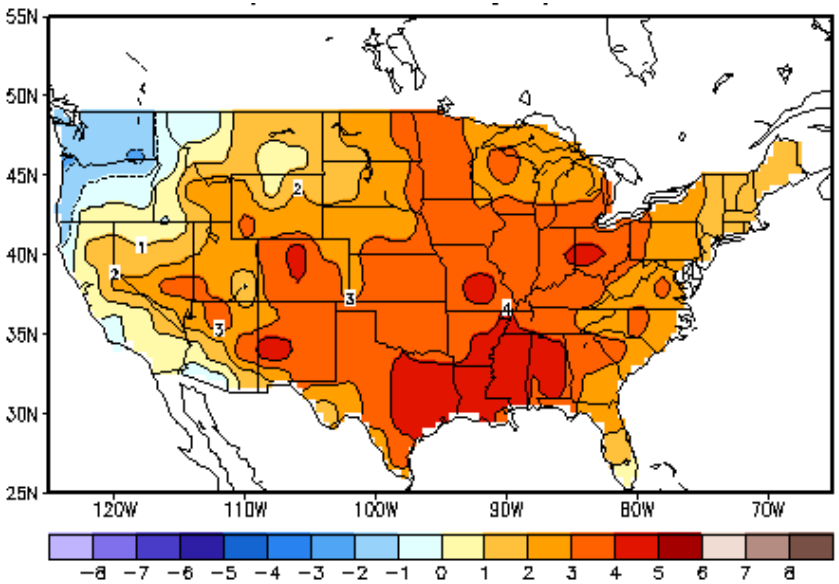
U.S. Temperature and Precipitation Departures During the Last 90 Days

End Date: 8 April 2017

Percent of Average Precipitation



Temperature Departures (degree C)

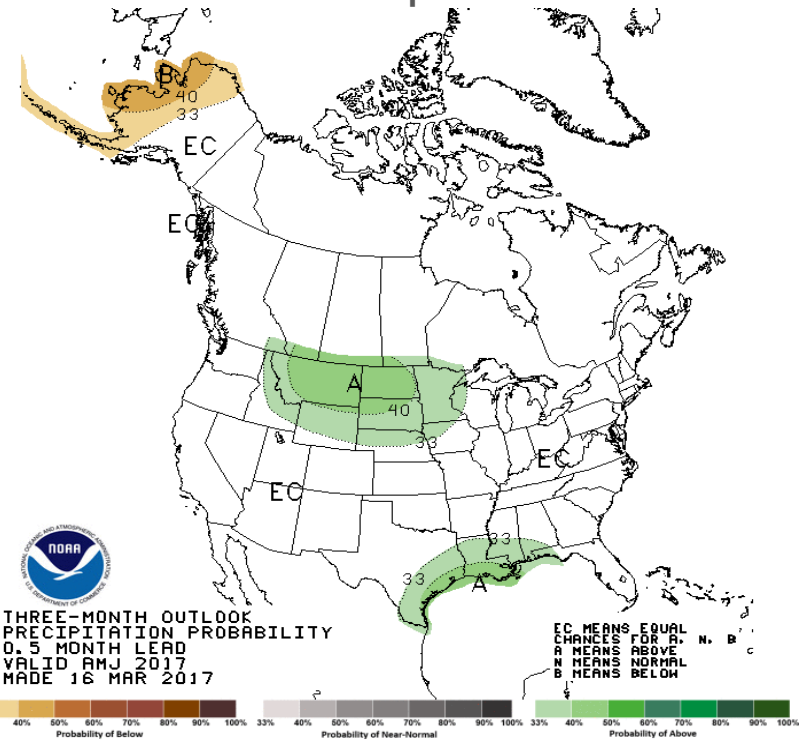


U. S. Seasonal Outlooks

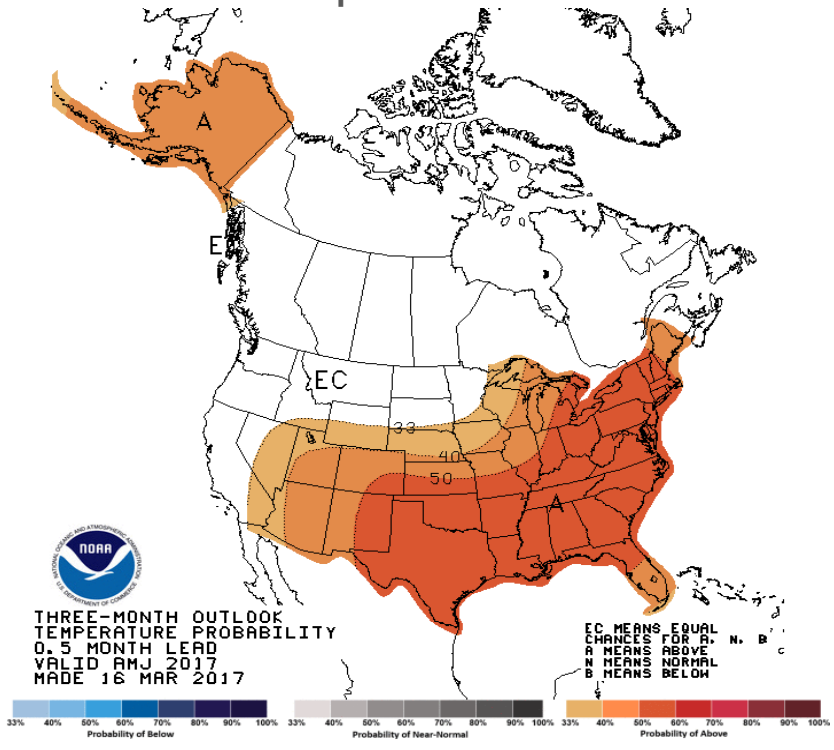
April - June 2017

The seasonal outlooks combine the effects of long-term trends, soil moisture, and, when appropriate, ENSO.

Precipitation



Temperature



Summary

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